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## REMARKS

Claims 1-15, 17-22, 24, 27, and 28 remain pending. The cancellation of claims 16, 23, and 29-31 obviates their rejections.

In the Final Office Action, the Examiner rejected claims 1-13, 15, and 27-31 as being unpatentable over Goodson et al. (U.S. Patent No. 6,942,018) in view of Chrysler et al. (U.S. Patent No. 4,765,397); rejected claims 14 and 19-22 under 35 U.S.C. § 103(a) as being unpatentable over Goodson et al. in view of Chrysler et al. and further in view of Tuckerman et al. (U.S. Patent No. 4,450,472); rejected claims 16-18 under 35 U.S.C. § 103(a) as being unpatentable over Goodson et al. in view of Chrysler et al. and further in view of Crowe (U.S. Patent No. 4,944,344); and rejected claims 23 and 24 under 35 U.S.C. § 103(a) as being unpatentable over Goodson et al. in view of Chrysler et al. and further in view of Tuckerman et al. and still further in view of Crowe.

### Claims 1-9:

Claims 1-9 are patentable under § 103(a) over any reasonable combination of Goodson et al. and Chrysler et al. Independent claim 1, as amended, requires a device including, *inter alia*, “enclosed channels to carry a liquid coolant that are proximate to a surface of the integrated circuit chip and that extend in parallel lines along an entire length of the integrated circuit chip.” No reasonable combination of the references teaches or suggests this limitation.

The two figures of Goodson et al. that show channels in parallel lines, Figs. 4 and 5, neither teach nor suggest these channels extending “along an entire length” of the integrated circuit chip, as required by claim 1. As explained in previous responses, Chrysler et al. does not teach or suggest a structure for an integrated circuit chip, but rather circuit boards of modules in “the shape of a thin square several inches on a side” containing a hundred or so such chips (see col. 1, lines 31-38). Thus, Chrysler et al. also fails to teach or suggest enclosed channels extending in parallel lines long an entire length of an integrated circuit chip.

Further, the disclosure in Figs. 4 and 5 of Goodson et al. of channels extending to the edges of the integrated circuit chip in a back-and-forth or zig-zagging manner teaches away from

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any modification of this reference to meet the “in parallel lines along an entire length of the integrated circuit chip” language of claims.

For at least these reasons, claims 1-9 as amended are patentable under § 103(a) over any reasonable combination of Goodson et al. and Chrysler et al.

**Claims 10-15, 19-22, and 24:**

Claims 10-15, 19-22, and 24 are patentable under § 103(a) over any reasonable combination of Goodson et al., Chrysler et al., and Crowe. Independent claim 10, as amended, requires a device including, *inter alia*, “an upper heat exchange layer over and in a parallel plane to the heat exchange layer and including parallel upper channels formed therein that are enclosed and suitable for carrying liquid coolant.” Independent claim 19, as amended, requires a device including, *inter alia*, “a heat exchange layer over and parallel to the cap and including linear upper channels formed therein that are enclosed and suitable for carrying liquid coolant.” No reasonable combination of the references teaches or suggests these limitations.

Goodson et al. fails to teach or suggest an upper heat exchange layer at all. Crowe may disclose fins 12 and 25, but these do not define “enclosed” channels as required by claims 10 and 19. Thus, no reasonable combination of the references meets all limitations of the claims.

Also, Crowe does not concern an “integrated circuit chip” or a “semiconductor base” as required by the claims, and one of ordinary skill in the art would not have been motivated to look to the “hermetically sealed modular electronic cold plate” art (col. 1, lines 7 and 8) used in aircraft applications (col. 1, line 53; col. 2, line 47) for cooling a single integrated circuit or semiconductor device.

For at least these reasons, claims 10-15, 19-22, and 24 as amended are patentable under § 103(a) over any reasonable combination of Chrysler et al., and Crowe.

**Claims 27 and 28:**

Claims 27 and 28 are patentable under § 103(a) over any reasonable combination of Goodson et al. and Chrysler et al. Independent claim 27, as amended, requires a method

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including, *inter alia*, "forming second parallel channels in the layer of a semiconductor device adjacent to one end of the first channels and in a same direction as the first parallel channels, the second parallel channels having a greater average width than the first parallel channels." No reasonable combination of the references teaches or suggests this limitation.

Goodson et al. fails to teach or suggest forming second parallel channels in a layer of a semiconductor device adjacent to one end of first parallel channels. See, for example, Fig. 4 or Fig. 5 of Goodson et al. As explained before, Chrysler et al. fails to teach or suggest forming anything in a "layer of a semiconductor device," because it is not concerned with a single semiconductor device or layers thereof.

For at least these reasons, claims 27 and 28 as amended are patentable under § 103(a) over any reasonable combination of Goodson et al. and Chrysler et al.

Reconsideration and allowance of claims 1-24 and 27-31 are respectfully requested.

In the event that any outstanding matters remain in this application, Applicants request that the Examiner contact Alan Pedersen-Giles, attorney for Applicants, at the number below to discuss such matters.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-0221 and please credit any excess fees to such deposit account.

Respectfully submitted,

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